IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of:	Confirmation No.: 6015
Bouet-Griffon *et al.*	Group Art Unit: 1793
Application Serial No.: 10/561,010	Examiner: LEE, Rebecca Y.
Filed: December 16, 2005	Attorney Docket No.: 2901683-000026

For: AUTOBODY SKIN PIECE MADE OF AN AL-SI-MG SHEET METAL ALLOY AND FIXED TO A STEEL STRUCTURE

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Declaration of Dr. Gilles GUIGLIONDA

1. My name is Dr. Gilles Guiglionda. I believe I am competent to make this declaration. Unless otherwise stated, all statements herein are made only on the basis of current personal knowledge and belief.

2. I am a French citizen

3. I am fluent in both written and spoken English.

4. I have a PhD degree dated 2003 in Materials Science and Engineering from the French Institut National Polytechnique de Grenoble and Ecole Supérieure des Mines de Saint-Etienne. I have worked in the aluminium industry for over 7 years specializing in sheet products for automotive. I have been working for Alcan and its predecessor companies for more than 10 years. I am one of ordinary skill in the art in this field.

5. I am a co-inventor of the above-identified patent application, U.S. Application No. 10/561,010. I have personal knowledge of all of the subject matter disclosed therein.

6. I have reviewed both U.S. Patent No. 4,082,578 to Evancho *et al.* and the office action dated November 20, 2009 and am familiar with the subject matter disclosed therein.

7. As currently amended, claim 1 of the present application requires that the aluminium alloys have, *inter alia*, yield strength of less than 170 MPa after solution treatment, quenching and age-hardening for three weeks at room temperature. This particular yield strength allows the alloy to be formed relatively easily.

8. Alloys having this yield strength at this point in processing simply are not disclosed by Evancho.

9. Yield strength depends on both the chemical composition and the metallurgical structure, which is influenced by processing conditions such as quenching conditions. Accordingly, a person having ordinary skill in the art could not predict the physical characteristics of one alloy based on an alloy having similar constituents, but different processing steps.

10. The present alloys as claimed have a yield strength below 170MPa <u>after 3 weeks of natural aging</u>. All of the low yield strength values disclosed by Evancho et al. were measured at much less than 3 weeks of natural ageing. As can be seen at example 10 and table 6 of Evancho, the exemplary alloy disclosed therein has yield strength of 17.6 ksi (121 MPa) after one day of aging, but 26.6 ksi (183 MPa) after one week of aging, 27.2 ksi (187.5 MPa) after two weeks of aging, and 28.5 ksi (196.5 MPa) after four weeks of aging. Therefore, the yield strength of the Evancho alloys after three weeks of aging clearly exceeds the requirements of claim 1.

11. Claim 1 presently relates to "An auto body roof comprising at least one steel frame and a skin part comprising an aluminium alloy attached to the steel frame before painting . . . ." Classical aluminium alloys cannot be attached to a steel frame before painting because, under the high temperature of the paint baking step, skins made of aluminium expand at a different rate than the steel frame. Because auto body roofs are linearly fixed to the steel frame at each edge, there are few degrees of freedom available for the aluminium skin to expand more than the steel frame, particularly in areas close to the aluminium-steel junctions. As a result, classical aluminium skins tend to undergo plastic deformation during the paint baking step, leading to kinks and other aesthetically unacceptable deformities. *See, e.g.*, paragraphs [0022] to [0024] and figure 5 of the published application. These troublesome plastic deformations commonly occur when the part is subject to electrophoresis treatment (typically 195°C for 30 min.) or potentially when the part is subjected to long exposures to the sun, especially in hot weather conditions.

12. Many body parts like hoods and doors are not linearly fixed to a steel frame at all edges and therefore have a greater degree of freedom to expand, thereby reducing the amount of plastic deformation that occurs close to the aluminium-steel junctions.

13. As such, differential thermal expansion between aluminum and steel is much more detrimental in the roof section than in other body parts.

14. Accordingly, the present alloys have been formulated to have sufficient high-temperature yield strength to avoid plastic deformation under such conditions. As currently amended, claim 1 of the present application requires the aluminium alloy to have "a high temperature yield strength, at the beginning of a paint baking heat treatment after a temperature rise, of at least 160 MPa". This high yield strength value at high temperature (typically 190°C) prevents the aluminium panel from forming aesthetically unacceptable kinks due to the differential thermal expansion between the aluminium panel and the steel frame of the vehicle.

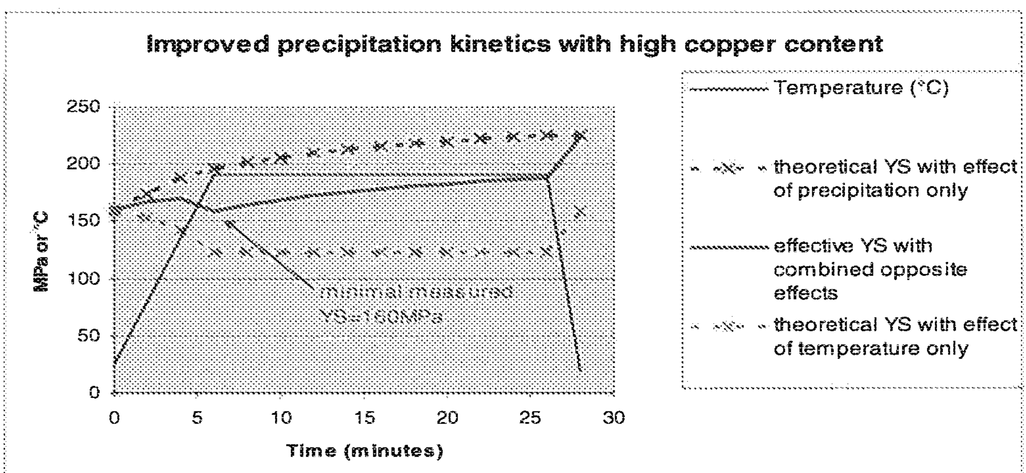
15. As shown at Example 5 of the present application, the use of a classical alloy – such as the ones of Evancho – in a roof would inevitably lead to kinks or other defects as a result of the lack of strength. Example 5 relates in part to a 6111 alloy with composition (in wt%) of 0.63 Si, 0.11 Fe, 0.69 Cu, 0.17 Mn, 0.78 Mg, and 0.07 Cr. This chemical composition is equivalent to the range of the claim 1 of Evancho (with a Mn content of 0.17% versus 0.2% in Evancho). As can be seen at Fig. 2, this alloy does not perform as well as alloy 6056, which falls within the chemical composition claimed by present claim 1. Indeed, the 6111 alloy has a yield strength after three weeks of 179 MPa, which is higher than the upper yield strength limit allowed by claim at this point, but a high temperature yield strength of 159 MPa, which is lower than the minimum limit required by claim 1.

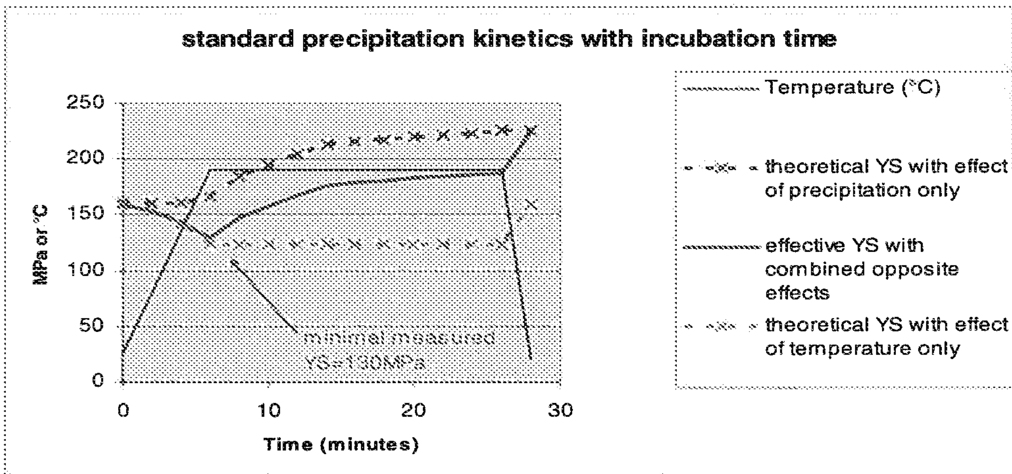
16. Contrary to the Examiner's argument, Evancho *et al.* do not teach that such deficiencies can be overcome simply by increasing the Cu content.

17. Evancho *et al.* are silent regarding the effect of Cu on high temperature yield strength. Moreover, the section of Evancho *et al.* at col. 7, lines 29–44 does not disclose a simple relationship between increased Cu concentration and increased yield strengths. At most, this section states that the presence of Cu in the disclosed amounts increases the spread between the forming and final yield strengths. It does not mean that increases in Cu concentration will increase high temperature yield strength (which is a different characteristic than room temperature yield strength) without unduly increasing the forming strength.

18. Even assuming that Evancho teaches that addition of Cu increases the final yield strength, this is irrelevant to the present claim set. Whether the strength level of the final product is higher or equal or lower will not influence the formation of a kink on the aluminium panel which occurs during or right after the temperature ramp-up. What is relevant to the present claim set is that the addition of Cu increases the yield strength measured at high temperature at the beginning of the paint baking heat treatment *i.e.* during and just after the ramp-up.

19. It has been surprisingly found that addition of higher concentrations of Cu increase high temperature yield strength at this point. Addition of Cu increases the yield strength measured at high temperature first by a solid-solution strengthening and also by increasing the kinetics of precipitation right from the beginning of the heat-treatment. In addition to chemical composition, depending on the processing conditions (such as quenching and pre-tempering treatment), the precipitation during the ramp-up in temperature can have an incubation time of various durations. Lengthened precipitation incubation times would delay the onset of hardening and induce a lower yield strength at high temperature just after the ramp-up. This is demonstrated in the below graphs.





20. Evancho *et al.* simply do not teach that addition of Cu would have any such effect.

21. In addition, a person having ordinary skill in the art could understand Evancho *et al.* at col. 7, lines 29–44 as teaching that Cu in excess of the disclosed amounts is detrimental to formability. It therefore was surprising to observe that sheets made of the alloy 6056, while harder in the T4 temper, have a formability equivalent to that of sheets made of alloy 6016. The recapitulative table attached shows an overlapping between the ranges of the AA 6016 and 6111 and the ones of the alloys of Evancho.

22. In addition, Evancho teaches that a Cu content between 0.25 and 0.50 % is especially imperative because Cu in excess can be detrimental to weldability. Notwithstanding this teaching, the present inventors have found that alloys according to claim 1 can be used to assemble a roof panel with the aluminium alloy being attached to the steel frame by laser welding.

23. Accordingly, a person having ordinary skill in the art would not have been able to predict that the presently-claimed alloys would have both the high temperature yield strength and the forming yield strength as presently claimed based on anything disclosed by Evancho *et al.*

24. I further hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further these statements remain with the knowledge that willful false statements and the like

so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

February 8, 2010	
Date	Gilles Guiglionda

	Si	Fe	Cu	Mn	Mg	Zn	Cr	R0.2 low T	R0.2 hot before	R0.2 hot after	Others
Claim 1	**0.7 - 1.3**	**< 0.5**	**0.8 - 1.1**	**0.4 - 1.0**	**0.6 - 1.2**	**< 0.7**	**< 0.25**	**< 170**	**> 160**	**> 200**	**Zr + Ti < 0.2**
Example	0.85	0.07	1.00	0.45	0.75	0.16	0.02	146 ou 169	168	223	
Reference 6111	0.63	0.11	0.69	0.17	0.78	No	0.07	179	159	191	
AA 6111	0.6 - 1.1	< 0.4	0.5 - 0.9	0.1 - 0.45	0.5 - 1.0	< 0.15	< 0.1				
AA 6016	0.9 - 1.5	< 0.5	< 0.25	< 0.20	0.2 - 0.6	< 0.20	< 0.1				
Evancho ex 10	1.13	0.18	0.47	0.43	0.78	No	No	28 ksi = 192			Ok
Evancho gen.	0.4 - 1.2	0.05 - 0.35	0.1 - 0.6	0.2 - 0.8	0. 4 - 1.1	< 0.2 pref 0.05		83 - 240			Ti : < 0.10
Evancho outer pref.	0.9 - 1.1	0.1 - 0.3	0.25 - 0.5	0.25 - 0.4	0.7 - 0.9	< 0.05	< 0.05	158 - 206			Ti : < 0.05
Evancho 6151 col 2	0.85	0.48	0.19		0.56	0.2	0.19	Trop dur			